

Mission Restoration Project

Invasive Plant Report

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for:

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Regulatory Framework

The Federal Noxious Weed Act of 1974, as amended (7 U.S.C 2801 et seq.) requires cooperation with state, local, and other federal agencies in the application and enforcement of all laws and regulations relating to management and control of noxious weeds (a summary of this act can be viewed at: <http://ipl.unm.edu/cwl/fedbook/fedweed.html>).

Executive Order 13112 (1999) directs Federal agencies to reduce the spread of invasive plants.

Okanogan National Forest Land and Resource Management Plan

The following Forest-wide Standards and Guidelines in the original Okanogan Forest Plan are relevant to this project:

12-1 Control noxious weeds to the extent practical.

12-2 New infestations of noxious weeds should be the first priority for eradication.

12-3 Emphasis on noxious weed control shall be the prevention of infestations, especially into un-roaded areas and wilderness.

Although the desired future condition of noxious weed populations are not specified in the original Forest Plan, it is implied by the discussions of other resources and the standards and guidelines above that the desired future condition of the forest would be an absence of new invader noxious weeds.

Northwest Forest Plan

In 1994 the Okanogan Forest Plan was amended by the Record of Decision for Amendments to Forest Service and BLM Planning Documents within the Range of the Northern Spotted Owl (Northwest Forest Plan), which included Standards and Guidelines pertinent to this project relating to invasive species:

Late Successional Reserve land allocations (Nice LSR): Nonnative Species – In general nonnative species (plant and animal) should not be introduced into [LSRs]...Evaluate impacts of nonnative species (plant and animal) currently existing within reserves, and develop plans and recommendations for eliminating or controlling nonnative species that are inconsistent with [LSR] objectives.

2005 PNW ROD Standards

In 2005 the original Okanogan Forest Plan was amended with the Pacific Northwest Invasive Plant Prevention and Management Record of Decision (2005 PNW ROD) (USDA-FS 2005). The following standards from the 2005 PNW ROD are relevant to this project:

Standard 1: Prevention of invasive plant introduction, establishment and spread will be addressed in roads analysis and vegetation management plans.

Standard 2: Actions conducted or authorized by written permit by the Forest Service that will operate outside the limits of the road prism (including public works and service contracts), require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering National Forest System Lands.

Standard 3: Use weed-free straw and mulch for all projects, conducted or authorized by the Forest Service, on National Forest System lands.

Standard 7: Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that is judged to be weed free by District or Forest weed specialists.

Standard 8: Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants in consultation with the District or Forest-level invasive plant specialist, incorporate invasive plant prevention practices as appropriate.

Standard 13: Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur. Non-native, non-invasive plant species may be used in any of the following situations: 1) when needed in emergency conditions to protect basic resource values (e.g., soil stability, water quality and to help prevent the establishment of invasive species), 2) as an interim, non-persistent measure designed to aid in the re-establishment of native plants, 3) if native plant materials are not available, or 4) in permanently altered plant communities. Under no circumstances will non-native invasive plant species be used for revegetation.

The following goals and objectives from the 2005 PNW ROD are relevant to this project:

- Protect ecosystems from the impacts of invasive plants through an integrated approach that emphasizes prevention, early detection, and early treatment. All employees and users of the National Forest recognize that they play an important role in preventing and detecting invasive plants. (Goal 1)

- Implement appropriate invasive plant prevention practices to help reduce the introduction, establishment and spread of invasive plants associated with management actions and land use activities. (Objective 1.1)
- Minimize the creation of conditions that favor invasive plant introduction, establishment and spread during land management actions and land use activities. Continually review and adjust land management practices to help reduce the creation of conditions that favor invasive plant communities. (Goal 2)
 - Reduce soil disturbance while achieving project objectives through timber harvest, fuel treatments, and other activities that potentially produce large amounts of bare ground. (Objective 2.1)
 - Retain native vegetation consistent with site capability and integrated resource management objectives to suppress invasive plants and prevent their establishment and growth (Objective 2.2)

Okanogan National Forest Integrated Weed Management Environmental Assessment (USDA-FS 2000)

This document provides site specific- analysis, guidance and direction for noxious weed control including herbicide applications to infested lands for a portion of the analysis area.

Okanogan and Wenatchee National Forests Weed Prevention Strategy and Best Management Practices (USDA-FS 2001a)

This document includes prevention measures necessary to help reduce noxious weed increases on the Forest.

Guide to Noxious Weed Prevention Practices (USDA-FS 2001b)

This guide provides a comprehensive directory of weed prevention practices for use in Forest Service planning and wildland resource management activities and operations.

Forest Service Manual and Handbook

Forest Service Manual 2080.2 directs the Forest Service to use an integrated weed management (IWM) approach to control and contain the spread of noxious weeds on National Forest System (NFS) lands and from NFS lands to adjacent lands. IWM is defined as an interdisciplinary pest management approach for selecting methods for preventing, containing and controlling noxious weeds in coordination with other resource management activities to achieve optimum management goals and objectives.

Forest Service Handbook (FSH) 2109.14 Pesticide Use and Coordination provides additional guidance related to implementation of invasive plant management, and FSM 2150 Pesticide Use and Coordination provides policy guidance.

National Strategy and Implementation Plan for Invasive Species Management (USDA-FS October 2004)

The National strategy for invasive species management (USDA-FS October 2004) has four elements listed below. Each of these elements is addressed in detail in the Prevention and Management Strategy document in the Mission Restoration Analysis file (McFetridge, 2016).

1. Prevention – Stop invasive plants before they arrive.
2. Early detection and rapid response – Find new infestations and eliminate them before they become established.
3. Control and management – Contain and reduce existing infestations.
4. Rehabilitation and restoration – Reclaim native habitats and ecosystems.

Relative to noxious weeds, the prevention strategy is always preferred and employed as the initial strategy. However, due to the pervasive characteristics of noxious weeds, the prevention strategy is often not adequate to ensure complete exclusion of noxious weeds.

The goal for noxious weed management in the Mission Restoration Project area is to prevent new infestations and spread of existing populations as a result of project activities, control non-native grasses and to restore these sites to native species.

Middle Methow and Libby Creek Watershed Assessment

Libby Watershed Analysis

Monitor and inventory existing sites. Develop and implement an integrated pest management plan for the watershed coordinating with Okanogan County Noxious Weed Board and adjacent land owners. Develop control measures at key or heavy use sites and use early treatment with new invaders

Middle Methow Watershed Analysis

Develop an Integrated Noxious Weed Management Plan for the Middle Methow Watershed. The plan should include all areas of land management with emphasis on prevention of noxious weed spread and preservation of biodiversity. Coordinate with county, state and other federal agencies, private landowners and businesses. Monitor both old and new grass seedings to determine effectiveness of different seed mixes to compete with noxious weeds. Develop guidelines for future reseeding or seeding.

Affected Environment and Environmental Consequences

Resource Indicators and Measures

Figure 1: Resource Indicators and Measures for Assessing Effects

Resource Element	Resource Indicator	Measure	Used to address: P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)?
Invasive Plant Spread	Spread of existing infestations	Acres of Invasive Plants within Treatment Units	Key Issue: Proposed project	R6 IPP FEIS 2005 Goal 1

		Miles of road infested with Invasive Plants affected by Proposed Road Changes	activities will effect invasive plants	ONF LRMP S&G 12-1 USDA FS (2004) Element 3
Invasive Plant Prevention	Introduction and Establishment of New Infestations	Acres of soil disturbance	Key Issue: Proposed project activities will effect invasive plants	R6 IPP FEIS 2005 Goal 2, Standard 1,2,3,7,8,13 ONF LRMP S&G 12-3 USDA FS (2004) Element 1
		Miles of road closures		

Methodology and Impact Analysis Definitions

The Resource Indicators are the establishment of new introductions and the spread of existing infestations. The risk of noxious weed introduction and spread is estimated by assuming that prevention management will be implemented through the project design criteria and mitigation measures. The introduction and establishment of invasive plants is proportional to the area of disturbance and the spread of invasive plants is generally proportional to area of existing weeds disturbed by project activities. For the purposes of this analysis, “disturbance” includes: 1.) exposed mineral soil, 2.) reduction of competing vegetation, and 3.) increase of light levels through the opening of the canopy. For this project, thinning treatments, underburning, and transportation system changes would cause at least some level of disturbance.

Gross Acres/Infested Acres

Most of the acreages used in this analysis are *gross acres* where areas are delineated by the outer perimeter of the weed infestation and may contain large areas that are not currently occupied by weeds. Multiple species can occur on a site; therefore some overlap in total gross acres may occur. Infested Area acres are defined differently, by the canopy cover of the plants, excluding areas not infested. (North American Weed Management Association 2002) Field data collected on the Methow Valley Ranger District has shown that the District infestation area is 6% (recorded in the Forest Service Natural Resource Information System) of the gross area and is typical for the weed populations within the project area.

Resource Indicator: Spread of existing infestations

Existing invasive plant population are susceptible to being spread by project activities and especially by project equipment. Acres of Invasive Plants within treatment units and miles of road infested with invasive plants affected by proposed road changes will be compared to the existing condition. Also changes in potential risk of spread of existing populations by general vehicle traffic will be compared for open and closed roads for each alternative as well as how the changes will effect treatment access.

Resource Indicator: Introduction and Establishment of New Infestations

Vehicles and transportation corridors are considered to be primary vectors for the movement of invasive plant species. Project activity units currently free of invasive plants would be susceptible to new weed infestations due to the current existence of invasive plants within the analysis area as well as Potential Invaders on adjacent Federal, State and private lands. Acres of soil disturbance and the miles of road to be closed will be compared to the existing condition.

Impact Analysis Definitions for Invasive Plants

Type of Impact

- Adverse: Increases invasive plant spread or introduces and establishes new infestations
- Beneficial: Reduces the potential for invasive plant spread and new introduction and establishment

Duration of Impact

- Short-term: Within the first growing season after project activities.
- Long-term: Up to approximately 20 years post-treatment.

Intensity of Impact

- None: No impact on invasive plant spread and new introduction and establishment
- Negligible: A change in invasive plant spread and new introduction and establishment would be so small that it would not be of any measurable consequence.
- Minor: A change in invasive plant spread and new introduction and establishment would be small and much localized.
- Moderate: A change in invasive plant spread and new introduction and establishment would be measurable and wider spread with some changes in the composition of desirable vegetation. The implementation of the design criteria would limit changes in composition of desirable vegetation. (A beneficial impacts would be a change
- Major: A noticeable change in invasive plant spread and new introduction and establishment resulting in severe adverse impacts. Effects to invasive plants would be measurable, widespread, and longer term with substantial changes in the composition of the desirable vegetation beyond the expected prevention benefits of implementing the design criteria.

Affected Environment

Resource Indicator: Spread of existing infestations

Existing Invasive Plant Infestations

Invasive plant populations within the project area are primarily associated with roads and the population densities are very low in the closed canopy understory of the proposed thinning treatment units. Weeds are also associated with old harvest activities as well as historic grazing. Few populations are present in undisturbed off-road areas where the highly competitive native plant communities impede the establishment of invasive plants.

Recent invasive plant inventories have occurred over most of the Mission Restoration project. Areas that were surveyed included known populations of noxious weeds, roads, areas of more recent disturbance and preferential habitats for invasive species. The Natural Resource Information System (NRIS) Database was used to determine approximate acreage of documented infestations.

Invasive plant populations in the project area fall into three primary categories. These categories are used to prioritize invasive species for inventory and treatment:

1. *Established Invaders* are those species whose population levels and distribution are such that seed production cannot be prevented.
2. *New Invaders* are invasive plant species that occur sporadically on the Forest and that may be controlled by preventing seed production and early treatment.
3. *Potential Invaders* are invasive plants that occur on lands adjacent to the project area but have not been documented on lands administered by the Forest; however, the potential for infestation is imminent.

Figure 2 lists new and potential invaders found within the Mission Restoration project area. Characteristics of these species are described in Appendix A in the Invasive Species Resource Report project file.

Figure 2: Established, New and Potential Invaders Within or Adjacent to the Project Area

Established Invaders	New Invaders within project area	Potential Invaders
Bulbous bluegrass	Baby's Breath	Bohemian knotweed
Bull thistle	Common burdock	Common tansy
Canada thistle	Houndstongue	Dalmatian toadflax
Cheatgrass	Oxeye daisy	Kochia
Curly dock	St. Johnswort	Orange hawkweed
Dandelion	Sulfur cinquefoil	Russian knapweed
Diffuse knapweed	Whitetop	Scotch thistle
Common mullein		

Invasive plant information for the project area has been conducted through the Okanogan-Wenatchee Forest-wide Invasive Plant draft EIS analysis and through recent inventories.

Figure 3: Invasive Plant Sites within the Mission Project Area

Invasive Plant	Gross Acres	Number of Sites
Baby's breath	1.25	1
St. Johnswort	2.33	4
Diffuse knapweed	224	20
Houndstongue	2.14	1
Common burdock	0.25	1
Oxeye daisy	5.42	3
Sulphur cinquefoil	3.63	2
Whitetop	4.11	4
Grand Total	243.13	36

Established Invaders

Seven Established Invaders occur throughout the project area: *Cirsium vulgare* (bull thistle), *Verbascum thapsus* (common mullein), *Centaurea diffusa* (diffuse knapweed), *Poa bulbosa* (bulbous bluegrass), *Taraxacum officinale* (dandelion), *Bromus tectorum* (cheatgrass),

Rumex crispus (Curly dock), and to a lesser extent, *Cirsium marvense* (Canada thistle). The lower priority established invaders are fairly widespread within disturbed areas in the project area and are so extensive Forest wide that they are not generally inventoried. The weed presence within the analysis area is primarily diffuse knapweed. Diffuse knapweed is the only Established Invader that has been inventoried and analyzed in this project, however not all populations have been mapped. It has invaded the open off-road grasslands areas with some dense populations. Small patches may be found within the restoration treatment units, however populations are very low in the dense conifer understory. Although well established locally, it is a state listed Class B noxious weed. It is not continuous; it occurs as scattered individuals and in some dense patches. Common mullein and bull thistle are less invasive and persistent than New Invaders. They quickly invade disturbed soil but generally do not out-compete most desirable vegetation and diminish over time. Similarly, Curly dock dominate disturbed areas in the forest understory, but generally do not outcompete native vegetation. Dandelion is well-established on some of the roadsides and on closed roads. Cheatgrass is present in patches throughout the project area and there are a few small Canada thistle sites.

New Invaders

New Invader species do occur within the project area but this area of the Methow Valley Ranger District is relatively free of New Invaders. Most of the new invader infestations within the project area are very small with populations less than 1. There are only 19 acres of New Invaders within the project area. Sulfur cinquefoil is established in patches along roads in the lower Ben Canyon and Mission Pond area. There is a relatively large oxeye daisy population along the 300 road in lower Chicamun Canyon and smaller populations in upper Chicamun and lower Hornet Draw. There is only one known population of houndstongue in the project just east of Hornet Draw. This site it virtually eradicated but there are well established populations on private and DNR land in the lower Libby Creek area. Common Burdock, Whitetop, St. Johnswort, and Baby's breath make up just a few small patches.

Potential Invaders

Of the potential Invaders not yet on National Forest System land, Bohemian knotweed (more commonly called Japanese knotweed or Mexican Bamboo) is the most difficult to control. It has a high potential to infest the project area, because there is a well-established patch in the Lower Twisp River area and several well established patches in the mid Methow Valley. There are populations of Dalmatian toadflax on private land throughout the Methow Valley with the closet populations in the Gold Creek area. Kochia is prevalent along roadsides and waist areas in the valley bottom. There was a population of orange hawkweed on private land near the confluence of Buttermilk Creek and the Twisp River – current status is unknown. Russian knapweed can be found in patches in the valley bottom and Scotch thistle, although very invasive, is still very limited in its distribution in the Methow Valley. The project area is relatively free of the New Invader weeds listed above, however there are relatively large populations of whitetop, houndstongue, and Baby's breath on non-Forest land in the Lower Libby Creek area with a high potential to spread onto Forest land.

Integrated weed management will continue within the project area. No new herbicide treatment will be proposed with this EA. All weed treatments have been approved under the 2000 Weed EA Decision Notices and will continue to be treated with herbicide as needed. Only the Buttermilk and Twisp river portion of the project area are covered under the 2000 weed EA. Currently no herbicide treatment is within the Libby watershed with some manual treatment of the new invader weeds. Bio control agents have been well established on diffuse knapweed in the Libby Creek area. The seed eating weevil, *Iarinus minutus* continues to retard the

knapweed populations with some rather dramatic reductions in density on some years. The knapweed populations swing depending on the weevil populations.

Invasive Plant Infestation on Roads within the Mission Project Area

Of the total 234 miles of road within the project area, approximately 62 miles are infested with invasive plants. These weed populations are mostly confined to the roadsides and with the exception of diffuse knapweed, generally occur in relatively small patches. Roadside populations may be dense in patches but are often very low with just a few scattered plants. Figure 4 shows the existing invasive plant presence on the current road by weed species.

Figure 4: Miles of Road Infested with Invasive Plants

Maintenance Level	Baby's breath	St. Johns wort	Diffuse knapweed	Oxeye daisy	Sulphur cinquefoil	White top	Total
1 - BASIC CARE (CLOSED)		0.06	20.55	0.07		0.07	20.75
2 - HIGH CLEARANCE VEHICLES		0.16	17.17	0.22	0.08	0.01	17.65
3 - SUITABLE FOR CARS	0.07		21.09		0.10		21.25
4 - MODERATE USER COMFORT			2.73				2.73
Total	0.07	0.21	61.54	0.30	0.18	0.08	62.38

Resource Indicator: Introduction and Establishment of New Infestations

Healthy native plant communities help preclude the establishment of invasive plants and pinegrass is the dominant competitive vegetation throughout the project area and provides good competition in deterring the establishment of new weed introductions and the spread of existing weed populations (Williams and Lillybridge 1983)

Roads are the primary vector to carry seed for new weed introductions. There are currently 56 miles of open road with an additional 15.7 mile of unauthorized road within the project area. The introduction of invasive plants would occur primarily on these open roads. Approximately 63 miles of closed road in the project area is not susceptible to movement of invasive plants by vehicle traffic.

Figure 5: Current Miles of Road within Project Area

Road Type	Current Miles of Road
Open NFS Road	56.1
Closed NFS Roads	62.8
Unauthorized Roads	15.7
Total	134.6

Environmental Consequences

Proposed Actions Dismissed from Further Consideration

The following proposed actions will not be considered further in this analysis because they would have no measurable effect on Invasive Plants: beaver habitat or coarse woody debris enhancement.

Alternative 1 – No Action

Resource Indicator: Spread of existing infestations and Introduction and Establishment of New Infestations

The No Action alternative would maintain the 56.1 miles of open roads, of which 41 miles are infested with invasive plants, and 62.8 miles of close roads, of which 21 miles are infested with invasive plants. Refer to Figure 9– Miles of Roads Infested with Invasive Plants by Alternative. As such, the No Action Alternative would have a higher potential for increasing the distribution (via vehicles) of invasive plants.

Invasive Plant introduction and spread by project vehicles and equipment would not occur. Ecological disturbance within the project area would increase due only to natural mechanisms (wind, water, wildlife, wildfire), on-going projects (cattle grazing), and public and administrative activity. With these mechanisms, introduction and spread rates would be dependent on natural conditions.

However, without the Mission Restoration Project, unnaturally high fuel levels would remain and the future condition would be expected to have a higher potential for severe wildfire. Fire is an important disturbance process in most ecosystems and usually favors early successional species. When noxious weeds are present, many native early seral species have been replaced or are out-competed by nonnative invasive species which can alter successional pathways and subsequent fires (Harrod and Reichard 2001).

In a wildfire, the creation of fire lines (whether by hand or dozer), helispots, and heliports removes competing vegetation, exposes mineral soil, and increases light levels. If the fire is large, then fire suppression resources may come from across the nation or from outside the United States, and may bring new weed propagules (seed or plant parts) with them. Fire fighters, fire equipment, dozers, trucks, and helicopters can all transport weed propagules to fire lines, helispots, and burned areas. The establishment of fire camps also disturbs soil. Weeds already existing in these camps can act as source populations for the introduction of new weed species into the burned areas (USDA Forest Service 2004b). In the event of a high-severity wildfire and subsequent suppression actions, the disturbance level and vehicle/equipment traffic level, with minimal mitigation, may far exceed the effect of the action alternatives under this project, and there would be a short to long-term, moderate, adverse impact on the spread and new introduction and establishment of invasive plants.

No temporary road construction, decommissioning, or road closures would occur. The current level of vehicle access would continue with the introduction and spread of weeds by road users occurring relative to the level of traffic.

Action Alternatives 2 and 3

Proposed thinning, prescribed fire, and soil treatments are identical in Alternatives 2 and 3 therefore the effects for both alternatives will be described together under Alternatives 2 and 3. The effects of the transportation changes will be analyzed under alternative 3.

Project Design Criteria

Figure 6: Design Criteria

Number	Design Feature	Why Necessary	Efficacy	Consequence of Not Applying
	<p>Areas of heavily disturbed soils (including landings, main skid trails, decommissioned temporary roads, and constructed road cut and fill slopes) will be reseeded. The Rangeland Management Specialists, Invasive Plant Specialist, and Botany Specialist will determine the appropriate seed mix, application rates, locations and time of seeding to meet erosion control and invasive plant competition objectives. Native seed will be the first choice in revegetation in areas where the objective is to restore the site to the landscape setting, such as decommissioned roads. Non-native seed may be used to help prevent the establishment of invasive species, in permanently altered plant communities, and in situations where locally collected native seed is not available (USDA Forest Service 2005). Use of non-native seed should be considered an interim non-persistent measure designed to aid the re-establishment of native plants.</p>	To Restore disturbed soil to native plants and prevent spread of invasive plants	Moderate	The spread of invasive plants will be increased. Soil erosion will be increased.
	Project Actions that will operate outside the limits of the road prism require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering National Forest System Lands	To minimize the spread of invasive plant seeds from heavy equipment.	Moderate	The spread of invasive plants will be increased.
	Qualified Forest Service staff will inspect active gravel, fill, sand stockpiles, quarries, and borrow material for invasive plants before use and transport of the materials. Only gravel, fill, sand, and rock that is judged to be weed free by the qualified inspector will be used. Treat or require treatment of infested sources before any use. Treat or require treatment of infested sources before any use of pit material.	To ensure that weed-free gravel, fill, sand, and rock will be used.	Moderate	The potential spread of invasive seeds from gravel, fill, sand, and rock may be increased.
	During dozer fireline construction, surface vegetation will be scraped away, while minimizing damage to live root crowns of native grasses and shrubs. This will allow for rapid post-burning recovery of the fireline, with residual intact roots helping prevent soil displacement and reducing the potential for invasive plant introduction, establishment, and spread.	To minimize the spread of invasive species during the construction of dozer fire line	Moderate	The potential spread of invasive plants may be increased.
	No hand fireline construction will occur within existing New Invader invasive plant patches. Populations near proposed containment lines will be identified on Burn Plan maps.	To minimize spread of invasive species by constructing hand fireline	Moderate	The potential spread of invasive plants may be increased.

	All know New Invader sites and areas with dense diffuse knapweed infestations in the project area and along access roads will be identified on the Timber Sale Area Map. Potential landing sites that are infested with dense diffuse knapweed or invasive plants classified as New Invaders will be prioritized for pre-treatment by the Invasive Plant Specialist. Landings will be constructed away from areas infested with New Invader weeds that have not been pretreated or on areas with dense diffuse knapweed populations.	To avoid spreading New Invaders from developing landing sites.	Moderate	The potential spread of invasive plants may be increased.
	Road blading, brushing, and ditch cleaning in areas with high concentrations of invasive plants will be conducted in consultation with the District Invasive Plant Specialists, incorporating invasive plant prevention measures, as appropriate.	To avoid spreading invasive plants with road reconstruction and maintenance.	Moderate	The potential spread of invasive plants may be increased.
	Pretreat dense knapweed populations where present within soil restoration treatments Units in order to prevent seed production.	To avoid spreading invasive plants with Soil Restoration Treatments	High	Seed baring plants may be spread into infested areas
	Prescribed fire treatments will exclude shrub steppe habitat unless including areas of habitat minimizes the amount of soil disturbance from fireline construction.	To minimize potential for invasive plant spread, particularly cheatgrass (<i>Bromus tectorum</i>).	Moderate	The potential spread of invasive plants, particularly cheatgrass, may be increased.

Figure 7: Resource Indicators and Measures for Alternative 2 and 3

Resource Element	Resource Indicator	Measure	Used to address: P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)?
Invasive Plant Spread	Spread of existing infestations by project activities	Acres of Invasive Plants within Treatment Units	N	R6 IPP FEIS 2005 Goal 1 ONF LRMP S&G 12-1 USDA FS (2004) Element 3
		Miles of road infested with Invasive Plants affected by Proposed Road Changes		
Invasive Plant Prevention	Introduction and Establishment of	Acres of disturbance	N	R6 IPP FEIS 2005 Goal 2, Standard 1,2,3,7,8,13

	New Infestations	Miles of road closures		ONF LRMP S&G 12-3 USDA FS (2004) Element 1
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Resource Indicator: Spread of existing infestations and Introduction and Establishment of New Infestations

Vehicles and transportation corridors are considered to be primary vectors for the movement of invasive plant species. Other vectors for spread include livestock, birds, insects, wildlife, wind and water. The introduction of nonnative plants can lead to substantial changes in the composition of the vegetation not only along road margins, but also, depending on dispersal abilities, may enable non-native plant species to spread into nearby habitats and beyond. The cascading ecological implication is further habitat loss (Bennet et al, 2011). As weeds are commonly associated with roads and old harvest activities, the potential effect of the Mission project on introduction and spread would be an increase of weeds on the road system and within areas of soil disturbance associated with the mission project activities. The risk of spread of New Invader weeds from existing populations is relatively low as there are only 19 acres within the project area.

Figure 8: Invasive Plant Infestations within Mission Project Area and Specific Restoration Treatment Activities

Invasive Plant	Acres	Treatment Unit Numbers	Treatment Activity	Number of Weed Sites
baby's breath	1.25	None		
St. Johnswort	2.33	359	TSI, HP, UB	5
		418	LFR, UB	
houndstongue	2.14	None		
common burdock	0.25	None		
oxeye daisy	5.42	057	LFR, DFR, MP	1
sulphur cinquefoil	3.63	047	LFR, DFR, MP	2
		407	LFR, UB	
whitetop	4.11	004	LFR, DFDMT, UB	3
New Invader Weeds Total	19.13			
diffuse knapweed	(*224)	Within all Units		
New Invader Acres within treatment units	15.49			
Grand Total	243.13			

*The sum total of gross acres of mapped diffuse knapweed. There are additional acres that have not been mapped.

Commercial Thinning, Noncommercial Thinning, including Ladder Fuels Reduction, Timber Stand Improvement, and Aspen Management Treatments

The introduction and establishment of nonnative plants can lead to substantial changes in the composition of the vegetation not only along road margins, but also, depending on dispersal abilities, may enable non-native plant species to spread into nearby habitats and beyond (Bennet, 2011).

Weeds exploit disturbed sites. These are areas that have reduced vegetation competition, exposed mineral soils, and high light levels. If weeds are present before disturbance, or weed seeds arrive after disturbance, weeds will commonly increase on disturbed areas. Most activities that disturb soil and increase light levels create favorable conditions for weed invasions. (USDA Forest Service 2004b).

The existing natural control for noxious weeds is the presence of native herbaceous plants species that compete with weeds. The conifer understory within the project area is a mix of bluebunch wheatgrass, domestic grass species, and pinegrass. The most effective is pinegrass, though it can also be strong competition for tree seedlings, which also can reduce weed establishment in the Douglas fir/pinegrass plant association (Williams and Lillybridge 1983). Where pinegrass is the dominant grass species, it would provide adequate competition to deter the establishment of weeds outside the disturbed areas.

As the weed populations are scattered and patchy, the gross area of weed distribution is much greater than the actual infested area; typically less than 10% of the gross area (see Gross Acres/Infested Acres Definition in Methodology section). This is a very small area relative to the total acres of harvest treatment. As weed populations within the project area are primarily associated with roads and the population densities are very low in the closed canopy understory of the proposed treatment units, there is virtually no risk of weed spread within the units. The spread of existing populations into the harvest units would be greatest in areas where the harvest activities intersect roads and historical harvest disturbance, however with the widely scattered weed distribution, weed spread by project vehicles and equipment from seed sources on roads is expected to be relatively low.

The forest restoration treatments would create a more open forest canopy. More light would provide more favorable conditions for noxious weeds; however, desirable plants that have been suppressed by a dense canopy would also benefit from a more open canopy. A study on understory response after thinning in a dense pine stand in the Upper Methow Valley found that pinegrass was 47% more abundant in thinned forests compared to uncut or unburned forests three years post-treatment (McConnell and Smith 1965). A study on the effects of thinning (and burning) on understory plant composition in ponderosa pine forests in Eastern Washington found that these treatments had surprisingly small effects on the composition, cover, and diversity of native forest understory plants 3-19 years post treatment. In contrast, the study found that nonnative plants showed small but positive responses to the combination of these treatments, with values much greater relative to no treatment, however nonnative plants remained a minor component of the vegetation in all treatments, averaging only 2% of the cover. (Nelson et al, 2008) It is expected that there would be a relatively low level of expansion, except in areas where light levels and soil disturbance have increased. These areas would have the highest potential for expansion of existing weeds and would have the potential for establishment of new weed introductions from seed spread. The overall weed cover would remain relatively low.

There would be a total of 1952 acres of commercial harvest. Summer ground-based harvest would cause soil disturbance associated primarily with landings and skid trails. The level of ground based soil disturbance for this project is estimated to be up to 10% of the unit area which would be approximately 200 acres (see soils section). However, winter operations are required in some units to minimize soil impacts unless the purchaser can present a plan of no more than 2% detrimental soil conditions per unit. Substantially less than 200 acres of soil disturbance would occur with winter logging. Ground based winter harvest on frozen soils has shown to result in less detrimental soil disturbance as compared to summer harvest (Reeves et al. 2011). The potential for new weed establishment and spread is greatly reduced as there is virtually no soil disturbance that would create suitable germination sites and spread of existing weeds would be very low as the seeds would be under the snow.

There would be 187 landings. Landing sites pose a greater risk of establishment and spread of invasive plants because the soil disturbance is concentrated within these sites. Potential landing sites that are infested with invasive plants classified as New Invaders would be prioritized for pretreatment by the Invasive Plants Specialist. Landing sites that have not been pretreated will be constructed away from areas infested with New Invader weeds. This mitigation will reduce the potential for spread.

Soil disturbance caused by commercial thinning would increase the potential for establishment of introductions of New Invaders adjacent to the project area and from Potential Invaders from adjacent private non-Forest lands. The Potential Invaders listed in the Affected Environment section are a priority for early detection and rapid response to control new infestations.

Areas of heavily disturbed soils would be seeded, including landings and main skid trails. This would reduce soil erosion potential and area for weeds to become established. Seeding would establish competitive species to help prevent the spread of existing populations, and introduction and establishment of new noxious weed species. Certified weed-free seed would be used to help prevent new populations and species of weeds from entering the project area.

The combination of design features to minimize ground disturbance during summer operations and optional winter logging over snow would greatly reduce soil disturbance and better maintain the cover and density of desirable competitive vegetation to prevent spread or establishment of new weed populations. The spread of existing infestations and the introduction and establishment of new infestations by commercial thinning treatments would be a short to long-term, minor, adverse impact.

The proposed noncommercial thinning would have a low risk of introduction and spread. Nelson et al. (2008) looked at the abundance of nonnative plants on roads relative to adjacent forest 3 to 19 years after thinning and burning treatments. Despite the abundance and proximity of weed seed sources on adjacent road corridors, cover and richness of non-natives were low within the treated stands; even in the most highly invaded sites (Nelson et al. 2008).

It is expected that there would be short term, negligible, adverse impacts to invasive plants as a result of the detrimental soil effects from proposed noncommercial thinning activities based on past monitoring of noncommercial thinning activities. Noncommercial and ladder fuel thinning operations are conducted by hand crews working across the landscape, which causes little detrimental soil disturbance.

Soil Treatments

Soil restoration treatments would occur where detrimental soil compaction exceeds ONFLRMP standards. The soil restoration treatments overlap with some dense diffuse knapweed populations, primarily in Chicamun and Ben canyons. The dense populations are all in forest openings, typically associated with roadsides, with few to no knapweed plants in the forest understory. The dense patches are very obvious and all populations would be pretreated where present within soil restoration treatments areas. The plants would be treated prior to seed production and would greatly limit the potential of spread. It is not anticipated that the seeds in the soil seedbank would attach to the subsoiler. The seeds would slide past along with the soil. A negligible amount of soil would attach to the subsoiler. New germination created by the soil disturbance would be post treated. A short-term, negligible, adverse impact is expected.

Prescribed Fire Treatments

It is not expected that underburning would increase the abundance of existing weeds with the exception of small high severity burned spots. A short-term, negligible, adverse impact is expected. Prescribed fire can stimulate native vegetation growth and colonization by increasing the availability of nutrients, space, light and water. These same attributes can also encourage establishment of invasive plants that may be better suited to occupy niches in fire areas that have burned too severely for natives to resprout or recolonize. Post-fire recovery of native species is determined by colonizers that seed into disturbed areas and survivors that resprout following fires (Brooks and Pike 2001). The responses of plant communities to fire depend on a host of factors, including the frequency and severity of fire, season and spatial extent of burns, preburn vegetation occurrence (including non-natives) and phenology, site conditions (particularly moisture, available nutrients, light, and disturbance history); and postfire conditions, including weather and availability of seed from invasive plants (Zouhar, Kristin et al. 2008). In a recent study in western Montana, prescribed burning was applied to weed infested bunchgrass communities. The primary target weeds were spotted knapweed, Dalmatian toadflax, St. Johnswort, and leafy spurge. The low severity early spring burns implemented in this study did not affect weed abundances during the period of response measurement. Target weed

abundance on burn plots did not differ from target weed abundance on the check plots (Zouhar, Kristin et al. 2008). Prescribed underburn fires are designed to be low intensity with short residence times. These types of burns normally do not generate enough heat to consume organic duff layers. If duff is consumed, it is normally restricted to small discontinuous spots (See section 3.8 Soils). The spots that have burned too severely for natives to resprout or recolonize will likely be the only areas where there would be an increase in abundance of established invaders and to a lesser extent, New Invader weeds from prescribed fire.

Proposed thinning treatments would create slash piles which would be removed through burning. Both hand piling and machine piling would be used. Machine piles would be between 4' x 4' up to 8' x 8'. Machine piling the slash would result in soil disturbance however the largest piles are typically placed in the pre-existing disturbed soil areas within landings minimizing the level of additional disturbance. Large slash pile burning concentrates the heat of the fire in a single location, causing greater disturbance to the soil and plants in the area of the pile. Pile locations would be seeded post-burning. A study of slash pile burning in ponderosa pine forests found that burning of larger slash piles nearly eliminated populations of viable seeds and generated scars with increased susceptibility to invasion of exotic plant species (Korb et al. 2004). Native seed was used in the study which found that at a minimum, the slash pile areas need to have seed amendments and that amending the slash pile scars with native seeds increased the cover of native forbs and grasses and reduced the cover of exotic weed species relative to untreated scars. In addition to seeding, potential landing sites that are infested with New Invader weeds would be a high priority for pretreatment under the 2000 Noxious Weed Environmental Assessment. Landings that have not been pretreated would be constructed away from areas infested with New Invader weeds. Machine piling equipment would be cleaned prior to entering the project site. A short-term, moderate, adverse impact to invasive plants is expected where some of the established invader weeds like common mullein and bull thistle would increase in the burned areas of the larger slash piles but give way to natives after about 5 years.

Burning of hand piles would create suitable sites for weed introduction and spread but to a much lesser extent than the large slash piles as the pile size would be much smaller. A short-term, negligible, adverse impacts is expected. Smaller piles burn at a lower intensity and are more quickly revegetated by existing desirable vegetation than large piles and are usually preferred (USDA Forest Service 2008). However, similar to lower intensity prescribed underburn fires, the soil within the burned interior of the relatively small piles would be less likely to lose the organic duff layer and natives would be more likely to re-sprout. Where pinegrass is associated with the burn piles, it is expected that natural regeneration would occur. Pinegrass sprouts from rhizomes and establishes from seed following fire. It may bloom profusely for the first two or three post-fire years, allowing rapid colonization of burned areas. It can also invade burned areas from off-site sources. Pinegrass generally increases in response to fire, often exceeding pre-burn levels (Brown et al. 2000). Because pinegrass is a major component of the native understory plant community within the project area, it is expected that small pile burn scars would revegetate through natural regeneration, limiting weed introduction and spread.

Construction of the proposed 29.4 miles of hand fireline and 2.6 miles of machine fireline would increase the risk of weed spread and introduction. A short-term, negligible, adverse impacts is expected. To reduce the risk of spread, no dozer or hand line construction would occur within existing weed patches and existing roads and natural barriers will be utilized as firelines wherever possible to minimize soil disturbance. Hand lines would not be seeded as the line is usually not wide enough (up to 18 inches) to limit relatively rapid revegetation from existing native propagules. The dozer lines (3-5 feet wide) would predominately scrape off the

above ground biomass with much of the perennial roots remaining in the soil for regeneration. The Fuels specialist and Botanist will determine whether spot seeding is necessary to restore the line to its pre-disturbance natural vegetation. New Invader populations near proposed containment lines will be identified on Burn Plan maps so that the populations can be avoided.

Rock armoring, replacing undersized culverts or installing fish culverts, creating hardened fords.

The risk of introduction of new infestations or spread of existing infestations would be low as no ground disturbing equipment would be operated outside the limits of the road prism. If there is a need to work outside of the road prism for the culvert work, rock armoring, and hardened fords; these actions would require the cleaning of all heavy equipment prior to entering National Forest System Lands reducing the risk of new introduction and spread. A short-term, negligible, adverse impact is expected.

Alternative 3

The effects of all transportation changes will be analyzed for both alternative 2 and 3 under Alternative 3.

Resource Indicator: Spread of existing infestations and Introduction and Establishment of New Infestations

In this section, the two resource indicators will be discussed together. Refer to Figures 9, 10, and 11 below. Looking at the post project miles of road currently infested with invasive plants, including diffuse knapweed, there would be 62 miles of the total 136 miles of road. Looking exclusively at New Invader weeds St. Johnswort and Sulfur cinquefoil make up the bulk of the miles, but with less than ½ mile of the total 136 miles of roads infested. In addition to the 61.5 miles of mapped populations of diffuse knapweed, it is assumed that it can be found on all roads but with some relatively long stretches without any plants, some stretches that are widely scattered, as well as some very dense patches. Looking at miles of road proposed to be closed and decommissioned that have invasive plant populations, alternative 3 would have over twice as many miles as alternative 2. The no action alternative would have similar miles of infested open road but many more miles of closed road than the action alternatives.

Figure 9: Miles of Roads Infested with Invasive Plants by Alternative

Alternative	ML1 (closed)	ML2,3,4 (open)	Decommission	ML2 Admin	Totals Miles
No Action	19.30	42.99			62
Alt 2	4.99	42.99	9.82	4.76	62
Alt 3	10.88	30.25	21.09	.03	62

Figure 10: Alternative 2 Miles of Road Infested with Invasive Plants

Maintenance Level	Baby's breath	St. Johnswort	Diffuse knapweed	Oxeye daisy	Sulphur cinquefoil	White top	Total Miles
1 - BASIC CARE (CLOSED)			4.97	0.02			4.99
2 - HIGH CLEARANCE VEHICLES		0.16	18.32		0.08	0.01	18.57

3 - SUITABLE FOR CARS	0.07		21.33		0.10		21.49
4 - MODERATE USER COMFORT			2.73				2.73
D - DECOMMISSION		0.06	8.37	0.08			8.51
D - DECOMMISSION WITH STOCK TRAIL			1.14				1.14
D - DECOMMISSION WITH TRAIL			0.17				0.17
ML2 Admin			4.51	0.22		0.03	4.76
Total	0.07	0.21	61.55	0.32	0.18	0.04	62.36

Figure 11: Alternative 3 Miles of Road Infested with Invasive Plants

Maintenance Level	Baby's breath	St. Johnswort	Diffuse knapweed	Oxeye daisy	Sulphur cinquefoil	White top	Total
1 - BASIC CARE (CLOSED)		0.10	10.77				10.88
2 - HIGH CLEARANCE VEHICLES		0.05	5.88		0.08	0.01	6.03
3 - SUITABLE FOR CARS	0.07		21.33		0.10		21.49
4 - MODERATE USER COMFORT			2.73				2.73
D - DECOMMISSION		0.06	19.57	0.32			19.94
D - DECOMMISSION WITH STOCK TRAIL			1.14				1.14
D - DECOMMISSION WITH TRAIL			0.01				0.01
ML2 Admin			0.12			0.03	0.15
Total	0.07	0.21	61.55	0.32	0.18	0.04	62.36

Invasive plant treatment access and spread by vehicle traffic are affected by changes in maintenance levels.

Road Closures: Alternatives 2 and 3 would close 34.8 and 33.8 miles, respectively. Invasive plant treatment access and spread by vehicle traffic are affected by changes in road maintenance levels. Closing open roads to ML1 or ML2 Administrative Use status would reduce the potential for weed spread by vehicles. However, access for weed treatments would be more limited with a slight reduction in treatment efficacy. It is expected that a long-term, beneficial, minor impact would be expected by road closures for both alternatives. The reduced risk of spread by vehicles outweighs the more limited access for treatment. For road closures, Alternative 3 would have the greatest benefit in reducing new introductions and spread of existing infestations.

Road Decommissioning: Alternatives 2 and 3 would disturb 33.6 and 56.2 miles, respectively, of road by decommissioning. Diffuse Knapweed as well as other established invader weeds are present to some extent on all roads to be decommissioned. Other than the established invaders, the only new invader weeds are Oxeye daisy and St. Johnswort. Decommissioning may include blocking the entrance to a road or installing water bars; removing culverts, reestablishing drainages, removing unstable fills, pulling back road shoulders, and/or scattering slash on the roadbed; or completely eliminating the roadbed by restoring natural contours and slopes.

Decommissioning increases the risk of spread of existing populations and new introductions of weeds. Where weeds are established on the roadbeds, decommissioning activities may disturb dormant noxious weed seedbeds and increase weed densities. In a review of the benefits and impacts of road removal, Switalski et al. (2004) reported that decompacting the road surface loosens soil and increases infiltration capacity, improving the germination and growth of seeded plants. Switalski et al. (2004) looked specifically at road ripping and reported that while road

ripping has been shown to increase the rate of revegetation, it may also create conditions conducive to weed invasion. Monitoring and preliminary research, however, suggest that ripping may actually reduce the risk of invasions, because native vegetation is able to out-compete weeds and because ripping eliminates vehicles as a primary vector for further invasions.

A study was conducted on the Kootenai National Forest regarding the effects of road decommissioning on intact vegetation and the effects of seeding after decommissioning. They had expected that the short-term disturbance associated with decommissioning would result in high rates of weed invasion. In contrast, non-native plants were present at less than 1% cover one year after decommissioning. Given the low levels of non-natives immediately after road decommissioning, this time period may be crucial for establishing native vegetation before non-natives have the opportunity to colonize (Grant et al. 2011). Design Criteria that would be required by the action alternatives would seed all road disturbance activities and would be effective in native plant establishment. Seeding in the same operational season that the roads are decommissioned would be most effective to meet erosion control and invasive plant competition objectives establishing desirable vegetation before non-natives have the opportunity to colonize.

Off-road equipment would be brought in from areas outside the Forest that may have noxious weed infestations. The equipment may have mud or soil with noxious weed seed or plant parts attached. All off-road equipment would be cleaned prior to entering National Forest. Equipment cleaning would be effective in reducing the risk of invasive species introduction from this equipment.

With the implementation of the design criteria, the impacts of both alternatives would be reduced. A minor, short to long-term, adverse impact is expected for road decommissioning under alternative 2 and a moderate, short to long-term, adverse impact for alternative 3. Alternative 3 would have the highest risk of introduction of new invasive plants and spread of existing infestations than alternative 2 and a much higher risk than the no action alternative.

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

This cumulative effects analysis considers effects of past, present and reasonably foreseeable future actions along with the effects of the Mission Restoration Project. The geographic boundary for this cumulative effects analysis is the entire Mission Analysis Area plus adjacent private land. The temporal boundary is the period of time from the past 50 years, since the bulk of the road system was developed, to 10 years in the future, the time in which the alternatives have the potential to affect invasive plant spread and establishment.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Past Actions

In order to understand the contribution of past actions to the cumulative effects of the proposed action, this analysis relies on current environmental conditions as a proxy for the impacts of past

action. This is because existing conditions reflect the aggregate impact of all prior human actions on natural events that have affected the environment and might contribute to cumulative effects.

Present and Future Actions

Integrated weed management (IWM) within the Mission Analysis Area under existing Forest-wide decisions (USDA-FS 2000) would continue to reduce or eliminate New Invader weed infestations on roads. The combination of herbicide, manual, and cultural treatment would provide effective control of small populations. Treatments would be conducted by the DISTRICT Weed program with herbicide treatments authorized under the 2000 Okanogan National Forest Integrated Weed Management EA Decision Notices. The 2005 Invasive Plant Management prevention standards that apply to all applicable forest projects and would reduce the rate of spread from 8-12% to about 5% (USDA-FS 2005a). Although the rate of spread is slowed, spread is not entirely stopped.

The New Invader weed sites within the Mission Analysis Area would be prioritized and treated with herbicide as authorized by the existing IWM decisions. Not all weed sites would be treated. Priority sites that would be treated include weed populations on roads proposed for decommissioning and roads proposed for closure. Consequently, weed densities are currently being reduced or would be reduced along some roads before project implementation.

The Okanogan-Wenatchee NF Forest-wide Site-Specific Invasive Plant Treatment EIS will be completed by 2017, which would authorize the treatment of currently existing invasive species across the Okanogan-Wenatchee NF and would allow for treatment of infestations that are not currently inventoried through an Early Detection/Rapid Response (EDRR) strategy. The proposed invasive species treatments may begin within two years and continue for 15 years. Invasive plants would be treated using one or a combination of manual, mechanical, cultural, biological, and chemical methods. Priorities for treatment and selection of treatment methods would be consistent with those described in the R6 2005 FEIS (USDA-FS 2005a).

Potential Invaders on non-Forest lands listed in the existing condition section of this document could spread from outside the Mission Analysis Area along open roads from vehicular traffic to newly-disturbed closed or decommissioned roads. Some ongoing treatments are occurring on this populations, which are outside of the DISTRICT's influence.

Active fire suppression would continue in the Mission Analysis Area. Those fire suppression activities that include the use of the roads could transport New Invader seeds into and around the Mission Analysis Area. However, vehicle weed wash stations are often available and implemented and restoration work is completed on area of suppression disturbance.

All types of recreation would continue to be a source of weed introduction and spread within the Mission Analysis Area.

Cattle would continue to function as weed vectors for spread and introduction. It is likely that some of the New Invader populations were introduced by cattle within the Mission Analysis Area. Despite the relatively large number of cattle that are brought in from areas outside the Mission Analysis Area, extensive weed surveys in recent years have not detected any of the weed species listed as Potential Invaders and most invasive populations are along roads, not in the general forest where cattle graze.

The Motorized Travel Management Project would designate roads, trails and areas open for motorized vehicle use and close the remainder of the Forest to motorized use.

Road maintenance activities would continue to have the potential to spread weeds. Activities would include improvement of drainage structures, road surface shaping and grading, and ditch cleaning. In accordance with 2005 PNW ROD Standard #8, road blading and ditch cleaning in areas with high concentrations of invasive plants would be done in consultation with the District invasive plant specialists and would incorporate invasive plant prevention practices described in the Prevention and Management Strategy (USDA-FS 2004) as a way to minimize the spread of weeds.

Figure 12: Resource Indicators and Measures for Cumulative Effects for Alternative 2

Resource Element	Resource Indicator	Measure	Alternative 2 (Units)	Past, Present, and Future Actions (Units)	Cumulative Impacts (Units)
Invasive Plant Spread	Spread of existing infestations	Acres of Invasive Plants within Treatment Units	15.49 acres of New Invaders plus the Established Invader weeds	0	15.49 acres of New Invaders plus the Established Invader weeds
		Miles of road infested with Invasive Plants affected by Proposed Road Changes	62.36	0	62.36
Invasive Plant Prevention	Introduction and Establishment of New Infestations	Acres of soil disturbance	61 acres – decommissioning (33.6 mi.) Up to 200 acres – commercial thinning	0	61 acres – decommissioning (33.6 mi.) Up to 200 acres – commercial thinning
		Miles of road closures	34.8	0	34.8

Figure 13: Resource Indicators and Measures for Cumulative Effects for Alternative 3

Resource Element	Resource Indicator	Measure	Alternative 3 (Units)	Past, Present, and Future Actions (Units)	Cumulative Impacts (Units)
Invasive Plant Spread	Spread of existing infestations	Acres of Invasive Plants within Treatment Units	15.49 acres of New Invaders plus the Established Invader weeds	0	15.49 acres of New Invaders plus the Established Invader weeds
		Miles of road infested with Invasive Plants affected by Proposed Road Changes	62.36	0	62.36
Invasive Plant Prevention	Introduction and Establishment of New Infestations	Acres of soil disturbance	102 acres – decommissioning (56.2 mi.) Up to 200 acres – commercial thinning	0	102 acres – decommissioning (56.2 mi.) Up to 200 acres – commercial thinning
		Miles of road closures	33.8	0	33.8

Resource Indicator: Spread of existing infestations and Introduction and Establishment of New Infestations

Figure 14: Invasive Plant Prevention Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect?	Extent, Detectable?
Ongoing integrated weed management (IWM) including the 2005 prevention standards and the Invasive Species Treatment EIS	Yes	Yes	Yes	Ongoing weed management, the 2005 Invasive Plant Management prevention standards, and the Implementation of the Invasive Species Treatment EIS would have a major measureable effect.
Weed treatments of Potential Invader Weeds from non-Forest lands	Yes	Yes	Yes	Some invasive plant control has occurred and is expected to continue on adjacent non-Forest lands and roads within the Twisp River and Libby Creek watershed. This weed control work would add a minor benefit to the Implementation of the Invasive Species Treatment EIS.

Active fire suppression	Yes	Yes	Yes	An increase in new invader weed infestations within suppression actions would be measurable.
Recreation activities	Yes	Yes	No	No measureable change is expected.
Cattle grazing	Yes	Yes	Yes	Cattle grazing would continue with an expected minor increase in grazing distribution with a negligible increase in the spread of existing populations.
The Motorized Travel Management Project	Yes	Yes	Yes	Roads designated as closed to motorized vehicle access would not be subject to introduction and spread of invasive plants by motor vehicles and would have a minor measurable effect.
Road Maintenance	Yes	Yes	Yes	Ongoing road maintenance activities would have a measureable minor increase in spread of existing populations.

Conclusion

Spread of existing infestations and Introduction and Establishment of New Infestations

The cumulative effect of past, present, and reasonably foreseeable future actions and the proposed thinning treatments and transportation changes in Alternatives 2 and 3 would have short term, adverse, negligible to minor impacts on invasive plants. Ongoing integrated weed management work would add to the design criteria to reduce the spread and new introductions of invasive plants within the project area. Implementation of the Invasive Species Treatment EIS would increase the number of weed treatment options available and increase the area of infested lands that may be treated within the Project area. Using the EDRR strategy on newly discovered infestations would increase treatment effectiveness and reduce the potential for spread and establishment and of new populations. Active fire suppression would reduce the potential for large scale wildfire where the impacts of the suppression actions may far exceed the effect of the action alternatives under this project. The action alternatives would create more transitory range, potentially changing cattle distribution in the analysis area and increase access to invasive plant populations, however the large project area would lend to equal dispersal of cattle away from the existing populations. The Motorized Travel Management Project would reduce the miles of road accessible by motorized vehicles reducing the risk of introduction and spread of invasive plants. The Ongoing road maintenance activities would continue to have the potential to spread and introduce new infestations but combined with the ongoing weed treatments and the implementation of the Invasive Species Treatment EIS, the expected impacts would be short term and negligible.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

Both Alternatives 2 and 3 are compliant with Executive Order 13112, the Forest Plan (USDA-FS 1989) and the Northwest Forest Plan (USDA & USDI 1994a) standards because they "... include required prevention strategy standards which would minimize the creation of conditions

that favor invasive plant introduction, establishment and spread. Off-road equipment would be cleaned prior to entering the forest, and only weed free straw, mulch, gravel, fill, sand, or rock would be used. Native seed would be the first choice in re-vegetation in areas where the objective is to restore the site to the landscape setting, such as decommissioned roads. Non-native seed may be used to help prevent the establishment of invasive species, in permanently altered plant communities, and in situations where locally collected native seed is not available.

FSM 2080.2 is also followed because an Integrated Weed Management Approach is used through implementation of the existing Okanogan National Forest IWM decisions. Relevant parts of the Okanogan and Wenatchee National Forests Weed Management and Prevention Strategy and Best Management Practices (USDA-FS 2001a), the Guide to Noxious Weed Prevention Practices (USDA-FS 2001b) supporting the February 3, 1999 Executive Order on Invasive Species, and the National Strategy and Implementation Plan for Invasive Species Management (USDA-FS 2004) are also included in design criteria.

Summary

Spread of existing infestations and Introduction and Establishment of New Infestations

Under Alternative 1 Invasive Plant introduction and spread by project vehicles and equipment would not occur, however densely stocked stands with multiple canopy layers would not be thinned resulting in unnaturally high fuel levels with a higher potential for severe wildfire. In the event of a wildfire, fire suppression activities and the disturbed burned area would have a greater potential for introduction of new invasive plants as well as spread of existing populations. The current level of vehicle access would continue with the introduction and spread of weeds by road users occurring relative to the level of traffic.

Alternatives 2 and 3 would result in more soil disturbance than no action and a higher risk of spread of noxious weed seed. Both alternatives would also increase the risk of introduction of new noxious weeds into the project area by vehicles and equipment and would create more soil disturbance than alternative 1. However, implementation of the design features in conjunction with the Prevention and Management Strategy would reduce the risk of introduction and spread of noxious weeds. In addition, the action alternatives would reduce fuel levels more than no action, thereby reducing the risk of uncharacteristic high severity fire and the soil disturbance associated with fire effects and fire control.

Some of the proposed forest vegetation treatment units contain populations of invasive plants, but most of the populations are directly associated with roads and historical harvest activities. Few populations occur in undisturbed off-road areas. The spread of existing populations would be greatest in areas where harvest activities intersect roads and other historical disturbance (i.e., past timber harvest and grazing). The total acres of potential weed spread for all project activities is very small area relative to the total acres of forest restoration treatments.

Both action alternatives would reduce potential for spread in the long-term on closed and decommissioned roads by preventing vehicular access. The expected outcome would be a short-term increase in the abundance of Established Invaders and slight increases in the abundance of New Invaders. Alternative 3 would have more miles of decommissioning increasing the potential for new introduction and spread of weeds. In the long-term, with implementation of prevention strategies, mitigation measures, and on-going weed management,

the rate of spread of weed populations would be reduced, and weed populations along closed and decommissioned roads in this project area would be reduced.

Degree to Which the Alternatives Address the Issues

Figure 15: Summary comparison of how the alternatives address the key issues

Issue	Indicator/Measure	Alt 1	Alt 2	Alt 3
Proposed project activities would affect invasive plants by spreading existing populations and introducing new infestations	Acres of Invasive Plants within Treatment Units	0	15.49 acres of New Invaders plus the Established Invader weeds	15.49 acres of New Invaders plus the Established Invader weeds
	Miles of road infested with Invasive Plants affected by Proposed Road Changes	0	62	62
	Acres of soil disturbance	0	61 acres – decommissioning (33.6 mi.) Up to 200 acres – commercial thinning	102 acres – decommissioning (56.2 mi.) Up to 200 acres – commercial thinning
	Miles of road closures	0	34.8	33.8

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APPENDIX A

INVASIVE PLANT LIST AND CHARACTERISTICS

Figure 1. New and Potential Invaders Within or Adjacent to the Project Area and the State Noxious Weed Listing

New Invaders within project area	Potential Invaders
Baby's Breath - B	Bohemian knotweed - B
Common burdock - NL	Common tansy - C
Houndstongue - B	Dalmatian toadflax - B
Oxeye daisy - C	Kochia - NL
St. Johnswort - C	Orange hawkweed - B
Sulfur cinquefoil - B	Russian knapweed - B
Whitetop - C	Scotch thistle
(Diffuse Knapweed – B)	

Figure 2. New Invaders within Project Area

Species	Characteristics
Baby's breath <i>Gypsophila paniculata</i>	A persistent perennial plant with a thick, deep penetrating root system which allows it to survive in arid conditions; a problem where the native grasses have been disturbed; a single plant averages 13,700 seeds; wind appears to be the most important dispersal agent; both manual and chemical control have limited effectiveness.
Common Burdock <i>Arctium minus</i>	A biennial that reproduces by seed and grows to a 5-foot-tall, erect, bushy flowering stem. This weed is best known for the hooked bristles on its burs that stick to fur and clothing, a very effective dispersal mechanism. It grows in a wide range of soils

houndstongue <i>Cynoglossum officinale</i>	A biennial; seeds are 4 prickly nutlets (seeds) that attach to people, livestock, vehicles, for easy dispersal; a very strong competitor with desirable forage; generally non-palatable but toxic properties capable of poisoning livestock; shade tolerant and thrives in wetter grasslands.
oxeye daisy leucanthemum vulgare	<i>An aggressive perennial; invader of open forest, meadows and roadsides; strong sprouting from roots with branched rhizomes; reproduces vegetatively along rhizomes and by seed.</i>
St. Johnswort <i>Hypericum perforatum</i>	A perennial reproducing by seed or short rhizomes; easily established on roadsides; very slow in spreading off of roadside; difficult to control; biological control available.
sulfur cinquefoil <i>Potentilla recta</i>	A competitive long-lived perennial; unpalatable to grazing animals reducing forage for livestock and wildlife; adapted to a wide range of environmental conditions; reproduces by seed and uses early emergence to establish.
whitetop <i>Cardaria draba</i>	<i>A deep rooted perennial reproducing from root segments and seeds; highly competitive with other species once it becomes established; will set seed by early summer.</i>

Figure 3. Potential Invaders

<i>Species</i>	<i>Characteristics</i>
Bohemian knotweed <i>Polygonum cuspidatum</i>	An escaped ornamental becoming increasingly common along stream corridors and rights-of-way in Washington; a perennial with spreading rhizomes, can reach 8 feet in height and is often shrubby, very aggressive, capable of crowding out all other vegetation, rarely established from seed, primary spread is through mechanical movement of plant parts; several sites in Methow Valley bottom, one on Twisp River.
common tansy <i>Tanacetum vulgare</i>	Spreads mainly by seeds, and less commonly from creeping rhizomes, to form dense clumps of stems; an invader of disturbed sites; commonly found on roadsides, fence rows, pastures, stream banks and waste areas.

dalmatian toadflax <i>Linaria dalmatica</i>	<i>A perennial reproducing by seed and rhizomes; it is aggressive on roadsides and rangeland; difficult to control.</i>
Kochia <i>Kochia scoparia</i>	An annual that has a deep taproot and grows 1.6 to 4.9 feet tall. Reproduces from seeds, it typically produces around 14,600 seeds per plant. Seeds are dispersed in the fall when the plant becomes a tumbleweed. found on pasture, rangeland, roadsides, ditch banks, wastelands and cultivated fields. Very competitive in July and August.
orange and yellow (meadow) Hawkweed <i>Hieracium aurantiacum</i> , <i>Hieracium pratense</i>	A perennial with creeping stolons; forms dense patches and rapidly invades new areas; mostly vegetative reproduction; dispersed by wind, animals, and people, seeds not carried far by the wind - presumably dispersed > 1 km, minute barbs on the seeds stick to fur, clothing and vehicles; suitable habitat well above 5000 ft. in mountain meadows.
Russian knapweed <i>Acroptilon repens</i>	A creeping perennial; reproduces from seed and vegetative root buds; toxic to horses; very competitive in heavier soils of bottomlands; invades degraded areas dominating the plant community.
scotch thistle <i>Onopordum acanthium</i>	A biennial that often grows 8 feet or more in height and 6 feet in width; a problem on western rangelands; can form dense stands of the large, spiny plants and constitute a barrier to livestock movement; spreads rapidly; thrives in well-drained sandy soils; plants produce 8,400 to 40,000 seeds, dispersed by wind, humans, water, livestock, and wildlife.